

Safety Data Sheet

Ethyl methane- sulfonate

Division of Safety
National Institutes
of Health



WARNING!

THIS COMPOUND IS ABSORBED THROUGH THE INTESTINAL TRACT. IT IS TOXIC, CARCINOGENIC, MUTAGENIC, AND TERATOGENIC. IT IS AN IRRITANT AND IS CORROSIVE IN THE PRESENCE OF MOISTURE. AVOID FORMATION AND BREATHING OF AEROSOLS OR VAPORS.

LABORATORY OPERATIONS SHOULD BE CONDUCTED IN A FUME HOOD, GLOVE BOX, OR VENTILATED CABINET.

AVOID SKIN CONTACT: IF EXPOSED, WASH WITH SOAP AND WATER.

FOR EYE EXPOSURE, IRRIGATE IMMEDIATELY WITH LARGE AMOUNTS OF WATER. FOR INGESTION, DRINK PLENTY OF WATER OR MILK. INDUCE VOMITING. FOR INHALATION, REMOVE VICTIM PROMPTLY TO CLEAN AIR. ADMINISTER RESCUE BREATHING IF NECESSARY. REFER TO PHYSICIAN.

IN CASE OF LABORATORY SPILL, WEAR PROTECTIVE CLOTHING DURING CLEANUP. AVOID SKIN CONTACT OR BREATHING OF AEROSOLS OR VAPORS. USE AQUEOUS ALKALI TO DISSOLVE COMPOUND. WASH DOWN AREA WITH DILUTE ALKALI FOLLOWED BY SOAP AND WATER. DISPOSE OF WASTE SOLUTIONS AND MATERIALS APPROPRIATELY.

A. Background

Ethyl methanesulfonate (EMS) is a colorless liquid. It forms highly corrosive compounds in the presence of water. EMS is toxic, carcinogenic, mutagenic, and teratogenic in rodents. It has no commercial use but has been considered as a male contraceptive and chemosterilant.

B. Chemical and Physical Data

1. Chemical Abstract No.: 62-50-0

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2. Synonyms:

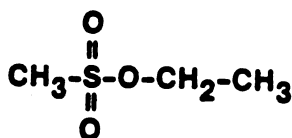
EMS

Half-Myleran

Methanesulfonic acid, ethyl ester (9CI)

3. Molecular
formula:
 $C_3H_8O_3S$

structure:



weight:
124.17

4. Density: 1.1451 g/cm³.

5. Absorption spectroscopy: No data.

6. Volatility: No data.

7. Solubility: Soluble in water.

8. Description, appearance: Colorless liquid.

9. Boiling point: 213°C.

Melting point: No data.

10. Stability: Stable in absence of moisture; hydrolyzed in water to the strongly corrosive methanesulfonic acid.

11. Chemical reactivity: EMS readily alkylates nucleophiles such as hydroxyl, amino, and sulfhydryl groups in model and biological materials (e.g., proteins). Hydrolyzed by excess aqueous alkali to noncorrosive and nontoxic products.

12. Flash point: No data.

13. Autoignition temperature: No data.

14. Explosive limits in air: No data.

Fire, Explosion, and Reactivity Hazard Data

1. EMS does not require special fire-fighting procedures or equipment and does not present unusual fire and explosion hazards.

2. A condition contributing to instability is the presence of moisture, which results in hydrolysis to free acid, which is highly corrosive to metals unless neutralized with alkali.

3. No other incompatibilities are known to exist.

4. EMS does not require nonspark equipment.

D. Operational Procedures

The NIH Guidelines for the Laboratory Use of Chemical Carcinogens describe operational practices to be followed when potentially carcinogenic chemicals are used in NIH laboratories. The Guidelines should be consulted to identify the proper use conditions required and specific controls to be implemented during normal and complex operations or manipulations involving EMS.

1. Chemical inactivation: No validated method reported.
2. Decontamination: Turn off equipment that could be affected by EMS or the materials used for cleanup. If more than 10 ml has been spilled or if there is any uncertainty regarding the procedures to be followed for decontamination, call the NIH Fire Department (dial 116) for assistance. Wash surfaces with copious quantities of water. Glassware should be rinsed (in a hood) with water, followed by soap and water. Animal cages should be washed with water.
3. Disposal: No waste streams containing EMS shall be disposed of in sinks or general refuse. Surplus EMS or chemical waste streams contaminated with EMS shall be handled as hazardous chemical waste and disposed of in accordance with the NIH chemical waste disposal system. Nonchemical waste (e.g., animal carcasses and bedding) containing EMS shall be handled and packaged for incineration in accordance with the NIH medical-pathological waste disposal system. Potentially infectious waste (e.g., tissue cultures) containing EMS shall be packaged for incineration, as above. Burnable waste (e.g., absorbent bench top liners) minimally contaminated with EMS shall be handled as potentially infectious waste and packaged for incineration, as above. Absorbent materials (e.g., associated with spill cleanup) grossly contaminated shall be handled in accordance with the chemical waste disposal system. Radioactive waste containing EMS shall be handled in accordance with the NIH radioactive waste disposal system.
4. Storage: Store in sealed glass ampoules or screw-capped bottles or vials with Teflon cap liners. Avoid exposure to moisture. Refrigeration is recommended.

Monitoring and Measurement Procedures Including Direct Field Measurements and Sampling for Subsequent Laboratory Analysis

1. Sampling: No data.
2. Separation and analysis: No specific methods have been reported. General methods for detection and estimation have been described, including colorimetric procedures using 4-picoline and o-dinitrobenzene as reagents (Sawicki and Sawicki, 1969) and the reaction with 4-(4-nitrobenzyl)pyridine (Preussmann et al., 1969).

F. Biological Effects (Animal and Human)

1. Absorption: Rapidly absorbed by the digestive tract in the mouse after intraperitoneal injection. Probably also absorbed after ingestion.
2. Distribution: After intraperitoneal injection in the mouse, there is rapid distribution with a pattern as follows (decreasing concentration after 24 hours): liver, lung, kidney, spleen, heart, skeletal muscle, brain, epididymis, and testes (Cumming and Walton, 1970).
3. Metabolism and excretion: Rapidly hydrolyzed in vivo. The resulting ethanol is either oxidized to CO_2 , which is exhaled, or reacts with the thiol group of cysteine or cysteine-containing compounds to form the corresponding S-ethyl derivatives, which are excreted in the urine. The biological half-life in the rat is calculated to be 6.5 hours (Roberts and Warwick, 1958). Upon administration to rats, EMS alkylates the N-7 position of guanine in nucleic acids in several organs (Swann and Magee, 1970).
4. Toxic effects: There are no data on acute LD50. The lowest lethal dose (mouse, intraperitoneal) is 200 mg/kg. Target organs in rodents are bone marrow (depression) and spermatozoa (abnormal shapes).
5. Carcinogenic effects: Intraperitoneal or subcutaneous injection of EMS in mice and rats produces lung and renal carcinomas (Roe et al., 1963; Hrushesky et al., 1972; Swann and Magee, 1969).
6. Mutagenic and teratogenic effects: EMS is positive in the Ames test and produces other mutagenic responses in animal cells in vivo and in vitro. Teratogenic effects have been noted in rats.

G. Emergency Treatment

1. Skin and eye exposure: For skin exposure, remove contaminated clothing and wash skin with soap and water. For eye exposure, irrigate immediately with copious quantities of running water for at least 15 minutes.
2. Ingestion: Drink plenty of water or milk. Induce vomiting.
3. Inhalation: Remove victim promptly to clean air. Administer rescue breathing if necessary.
4. Refer to physician. Observe for pulmonary irritation. Obtain ophthalmological consultation for eye exposure.

H. References

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